Collimated Phononic Lines for Non-Thermal (Acoustic) Chemical Catalysis

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Introduction

When it comes to building complex chemicals from precursor building blocks, we must follow a prescribed iterative process which often involves heating to specific temperatures for specific lengths of time after adding additional chemical building blocks to a chemical reactor. The need to introduce heat in the process of manufacturing chemicals is a key factor in the high cost of chemical manufacturing processes. Not only does the need to generate heat in such a process add to cost, but heat can result in the degradation of many complex chemicals shortly after they are formed.

If there were a method for encouraging the bonding of precursor groups (catalysis) other than heating, it would be possible to produce complex chemical structures (including explosives, which one would want to avoid heating) with greater safety and efficiency. As advanced Coulomb-based methods described by this author (ibid.) should enable the efficient manufacture of artillery shells without the need to use heat to melt metals, for example, the manufacturing process for the explosive compounds themselves represent essentially the last remaining bottleneck for artillery shell production. A non-thermal method for achieving efficient chemical catalysis would therefore represent a non-trivial strategic advantage if developed.

Abstract

Just as combustion is a process which is strongly linked with heat and in which, nonetheless, the introduction of certain forms of energy into combustive reactions can enhance or even trigger those reactions (this author's own soliton-enhanced (optionally low-heat) combustion being a prime example of this sort of enhancement,) chemical assembly (or synthesis) is a process driven by the energetic interaction of precursors. Each precursor must be physically propelled toward others in order to encourage the bonding of the chemical groups. The most commonly-used catalyst in inorganic chemistry is heat. The synthesis of new chemicals may be catalyzed in whole or in part by non-traditional mechanisms such as structured sound in a novel reaction process. While light is a useful catalyst in some organic chemistry applications, it is less useful in inorganic chemistry applications such as the manufacture of explosives or pharmaceuticals. Phonons may prove to form the basis of the next major breakthrough in inorganic chemical synthesis (ibid. 2022 publication concerning use of Coulomb-amplified "model molecules" which act as dies within nano-reactors to aid in the synthesis of basic precursors.)

When acoustic waves are transmitted through a medium, what is transpiring is the propulsion of small numbers of molecules over short distances with the acoustic wavefront propagating over a comparatively wide area. Like a great many billiard balls knocking into one another in succession and with little friction, groupings of phonons we term sound waves are a form of kinetic energy which slowly dissipates into thermal energy, which is, arguably, simply another form of kinetic energy.

Many chemical precursors may be joined in more than one way with each other, with some chemical structures being more useful than others for a desired application. Only those chemicals which have both the correct composition and physical structure, in some cases, are useful, meaning that a large quantity of reactant must be discarded (or perhaps recycled) in applications requiring structural specificity. One potential advantage of phononically-catalyzed inorganic chemical synthesis is the possibility of greater control over the probability of generating chemicals with desired structures.

The primary potential benefit of such a regime, of course, is the ability to prevent the premature degradation of the newly synthesized chemical structures without the need to rapidly chill the newly synthesized chemical and to manufacture chemicals without the need for furnaces which consume large amounts of energy.

To make this a reality, unique metallic magnetostrictive structures which generate and refract sound in particular ways should be employed within chemical reactors, with the ultimate goal being to maximize the likelihood of forceful collisions between precursors.

Key to achieving such a feat is the maintenance of the collimation of powerful, narrow beams of phononic energy. Maintaining the collimation of phonon beams is a very different enterprise than performing the same task with beams of light. Nano-scale acoustic waves of a non-collimated nature must be emitted in specific configurations and relative intensities i.e. in unison toward central junctions and with the waves being tailored to be stronger toward the center than at the outer edges. The latter goal can be achieved through the tailoring of the thickness of the magnetostrictive structures.

If phonon-generating nodes of a hexagonal shape are employed, for example, sonic energy could be projected inward toward a central junction within each hexagonal node. Lines projecting from the corners of that hexagonal structure toward the center would feature a high degree of collimation of phononic energy i.e. molecules would be pushed, like billiard balls, into one another in succession and in a linear fashion in these select zones. The presence of sound waves coming from near-parallel angles could be predicted to constrain phonon path within these select zones in which the kinetic force would be maximized. In addition phonon magnitude, the tapered intensity of sound waves in such a system could be used to improve the bracing effect upon the phonon laser. To understand this bracing effect, consider the difference between the distance a

baseball may be hit by a player holding a bat firmly and player holding a bat loosely. A phononic laser braced on two sides by wave segments of greater intensity than the collimated phonon beam itself is capable of projecting a greater degree of kinetic force against molecules than one braced by wave segments of equal pressure to the area of confluence.

To this, the ingredient of phononic currents moving from the precise opposite direction must be added in order to further increase the level of energy with which molecules interact as well as to maximize the duration of contact between molecules in the collision zones. This may be achieved by incorporating dual-source inverse-direction phononic emission systems of a slightly smaller scale which have a hinge-point which is shared with the inwardly-focused sound waves coming from the comparatively large hexagonal structures. These emitters would be essentially two metallic bodies with a slightly inward or pigeon-toed orientation in which the direction of sonic emission would be toward toward the surrounding hexagonal body.

Thus, for each of the six lines of convergence for the inbound sound waves there are two "pigeon toed" wave emissions designed to travel in the opposing direction. The confluence of two "phonon lasers" would generate sufficient force to promote synthesis of the desired chemical structures.

The phonon-emitting structures enabling this could most effectively be made to produce the desired acoustic energy through a process of magnetostriction. This would enable external RF variation to be used in order to attune the acoustic frequency and intensity to an optimum level to support synthesis of the particular compound desired. The timing of two distinct sets of RF pulses could be varied in order to vary the meeting point of the phononic lasers within the reactor in order to maximize efficiency. This, combined with a simple convection mechanism would be sufficient to form the basis of an effective acoustic reactor for the synthesis of inorganic compounds from precursors.

Conclusion

As the phononic lasers would be in perfect alignment, situations in which previously synthesized molecules are "sheared" by these forces leading to molecular degradation are highly unlikely, particular in comparison to high-heat methods.